

# Estimating the Welfare Loss to Consumers When Food Labels Do Not Adequately Inform: An Application to Fair Trade Certification

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## 1. Introduction

Firms spend billions of dollars annually on new product and label designs in order to attract and retain customers. The issue of labeling is also important to government agencies and nonprofit labeling organizations. For example, the U.S. Food and Drug Administration has an organizational body in its Office of Nutritional Products that deals with issues of food and dietary supplement labeling. The U.S. Department of Agriculture's Food Safety and Inspection Service also deals with labeling through its Labeling and Consumer Protection Staff. These government agencies spend millions of dollars trying to ensure that food labels adequately inform consumers. One issue that has not been examined is the welfare difference to consumers from alternative labeling schemes/regulations. It seems likely that different labels would differ in effectiveness at informing consumers.

Ideally, a government body would like consumers to know all relevant information about a food product before they make a purchase. However, this is usually impossible, so there would be a welfare loss for consumers who are not well informed because some would purchase products they would not otherwise purchase. This indicates that a welfare loss to consumers results from the existence of inadequate labels.<sup>1</sup> A first reaction of many would be that simply placing additional (accurate) information on a label would certainly lead to better consumer choices. However, there is evidence that simply placing information on a label may not be enough to adequately inform consumers. Noussair, Robin, and Ruffieux (2002) find that a label on the back of a product indicating that an ingredient is genetically engineered does not influence consumer behavior; however, when the attribute is specifically shown to consumers, their demand for the product drops. Beyond how and where to place information, however, is the question of what is the "right" information to place on a label.

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<sup>1</sup> There is another potential interpretation of labels: that they serve more as a signal of quality than as a source of information. Caswell and Padberg (1992) discuss how labels can help provide better signals to consumers about quality, especially when dealing with experience or credence goods. More recently, Marette et al. (2007) discuss how geographical indications on labels can serve as a signal of quality based on geographic origin. If one perceived labels as providing a signal instead of trying to inform, one would be assessing the welfare loss when a label sends an inadequate signal to consumers.

It is not safe to assume that more information on a label will automatically provide better information to consumers. Research has shown that labels containing too much information can adversely impact consumer decision making (Feick et al., 1986; Heroux, Laroache, and McGown, 1988). One recent study by Wansick, Sonka, and Hasler (2004) examines how well consumers can recall product traits based on alternative nutrition labels. They find that short nutrition claims on the front of packages do a better job of informing consumers about specific product attributes than longer labels.

More recently, researchers have begun to estimate the value of labels. Equivalently, these studies that place value on labels are simultaneously (and implicitly) measuring the welfare loss from labels that do not adequately inform consumers. Teisl, Bocksteal, and Levy (2001) estimated the value of nutrition labels and found that households placed a value on the nutritional information, on average, of between \$0.096 and \$0.542 per product each month. Dhar and Foltz (2005) estimate the value of labels on milk products indicating the products are rBST-free or organic vs. regularly labeled milk. They estimate a benefit to U.S. consumers of regularly labeled milk (which they call “unlabeled”) of approximately \$130 million annually, and a benefit of \$2.5 billion per year of having rBST-free and organic milk available in the market. Kiesel and Villa-Boas (2007) estimate the value of USDA organic seals on milk at \$2.1 billion annually to U.S. consumers.

While these studies implicitly estimate the welfare loss incurred by consumers from labels that do not adequately inform, they assume the label with more information is, by definition, the superior label. By doing this, these studies make an ex ante assumption on the superiority of a given label. Thus, according to these studies, any change in behavior must mean the consumer is gaining value from that label. This is a key limitation, as government agencies that make labeling laws may wish to examine alternative labels without ex ante knowledge of which label would best inform consumers.

This paper’s contribution is to present the design and implementation of an experimental auction that allows estimation of the welfare loss from labels relative to a state in which consumers have been provided with detailed, objective, verifiable information about a product. The experimental design tests multiple labels, but makes no ex ante assumption about which label will best inform consumers. This experimental design also allows for estimation of the welfare losses across labels, which could be a valuable tool for policymakers who are designing labeling regulations.

## **2. Experimental design**

We designed and conducted an experimental auction to examine the effects of alternative labels on consumer demand. Our goal was to determine the welfare loss from labels and also examine which label would best/worst inform consumers. We chose fair trade food products for this purpose. Fair trade food products, which are typically produced in developing countries for export, differ from conventional food products in that farmers are guaranteed above-market prices in exchange for abiding by labor and environmental practices laid out by the labeling organization. For example, in December 2005 cocoa producers were guaranteed a price of either \$1,750 per metric ton if the world price for similarly graded cocoa was at or below \$1,600, or the world price plus \$150 per metric ton if the world price exceeded \$1,600. Using fair trade products is ideal for a study on labeling, as many consumers may be unfamiliar with what is meant by “fair trade.” Because of this, it is unclear what type of label would best inform consumers.

We conducted our auction “in the field,” at a grocery store. Field experiments are gaining much more prominence in applied economic work, as they provide many of the benefits of laboratory experiments, but are conducted in settings that are more familiar to participants (Harrison and List, 2004). Several recent experimental auctions have been conducted in a field setting (e.g., see Rousu et al. 2005, Lusk et al. 2001b) because of the associated benefits. Chief among these is that the field environment (often a grocery store) is more familiar to participants, and the opportunity cost for participants is lower, allowing for lower participation fees. These field auctions can best be thought of as “framed field experiments” because they make use of laboratory valuation techniques but using a nonstandard pool of participants and a good widely available in the field (Harrison and List, 2004).

We conducted our field experiments at two Weis Markets grocery stores in Harrisburg, Pennsylvania in October 2005. A 2005 study conducted by the market research firm Acxiom found that Harrisburg was one of the twenty most demographically representative metro areas in the United States (Bremner, 2005). One hundred twenty-two participants took part in the study, either one at a time or in groups of seven or fewer, depending on how many other people were interested in participating at the same time. Table 1 presents demographic characteristics of auction participants.

### *2.1 Stages in the experimental auction*

The experimental auction had six stages:

*Stage one.* As shoppers entered the store, they were invited to take part in a “consumer research project” that would take about 15 minutes, and for which they would be paid \$10.

*Stage two.* The monitor provided participants with both written and oral instructions on the workings of the Becker-DeGroot-Marshak (1964) auction mechanism to be used.<sup>2</sup> In particular, the monitor explained that the participant(s) would place separate bids on a number of different goods, but that only one of these goods would actually be sold and that this would be determined at random. The monitor went on to explain that the binding price for that good would be determined at random by drawing a number from a jar containing sixty tickets marked with prices ranging from \$0.10 to \$6.00 in 10¢ increments.<sup>3</sup> Participants who submitted a bid greater than or equal to the binding price would purchase the good at the binding price; participants who submitted a bid lower than the binding price would purchase nothing. Participants were explicitly informed that it was in their best interest to bid truthfully. Participants were given a chance to ask questions, and they then took part in a practice auction.

*Stage three.* The monitor revealed the products for sale: a 2-pound bunch of bananas, a 2-pound bunch of fair trade bananas, a 3.5-ounce chocolate bar, and a 3.5-ounce fair trade chocolate bar.

*Stage four.* The monitor explained that participants would place separate bids on several food products, that only one of these bidding opportunities would be binding, and that the binding bid would be determined at random after all bids were submitted. Participants submitted their first set of four bids, and then were provided with objective information about fair trade certification before submitting another set of four bids.<sup>4, 5</sup>

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<sup>2</sup> We chose the demand-revealing BDM auction mechanism over other demand-revealing auction mechanisms (e.g., Vickrey auction, random nth-price auction) because we knew the number of participants would vary. The BDM auction is appropriate for either one participant or multiple participants, while the other common auction mechanisms will not work with only one participant.

<sup>3</sup> One inescapable drawback of the BDM auction mechanism is that the range from which the binding price is drawn may have an anchoring effect on participants' bids (i.e., participants may believe that the top or bottom end of the range conveys some meaningful information about a good's value.) While it is impossible to determine whether our data are effected by this kind of anchoring, because the price range was the same across participants and across products, any anchoring effect would be present for all bids. Later in the paper we use relative consumer surplus comparisons to determine whether participants would choose to purchase the conventional or fair trade version of a product. An anchoring effect that influenced bids for both products by the same absolute amount or by the same proportion would have no impact which product is chosen in this analysis.

<sup>4</sup> To test for the existence of a "Hawthorne effect" where participants bid differently in the second round not because of the information provided but because they believe the researcher expects them to, participants in a small pretest ( $N = 28$ ) were given no information between rounds. Bids did not vary significantly across rounds for any of the four products for sale.

<sup>5</sup> While participants placed two bids per product (one before and one after receiving information), we did not post the winning price between rounds. Proponents of posted prices argue that the practice provides market-like feedback that helps enforce rationality among participants who might place bids that are not consistent with their preferences (e.g., see Lusk et al. 2001a; Cherry

*Stage five.* The monitor randomly determined which of the eight bidding opportunities was binding, then randomly determined the selling price.

*Stage six.* Participants completed a survey about whether they had intended to purchase bananas or chocolate when they arrived at the store that day, the price they would expect to pay for those products outside of the experimental auction, and other demographic and background information. Participants were then dismissed one by one, at which point they were paid and any individual with a winning bid purchased the product. The auction instructions can be found in Appendix A.

## *2.2 Verifiable information*

Following Rousu et al. (2007) and Huffman et al. (2007), we provided participants with verifiable information about fair trade. With products that are new (or products produced in a new way), it is often difficult for consumers to receive accurate and unbiased information. Verifiable information provides an objective assessment of the benefits and costs, which should allow for more informed choices from consumers. The information that we presented to participants was approved as accurate by several parties with no financial ties to fair trade foods. The information used can be found in Appendix B.

## *2.3 Food products and labels*

Participants bid on two different food products in this experiment: bananas and chocolate. These were chosen because of the availability of fair trade versions of these products and because they are commonly consumed by Americans. To help ensure bids were not driven by perceived quality differences in the products, the fair trade and conventional bananas were carefully chosen to look similar and to weigh approximately the same amount (2 pounds). Both types of chocolate bars also weighed the same amount (3.5 ounces) and appeared similar. Labels for the conventional products were made as plain as possible to avoid any labeling/branding effects. Three different fair trade labels were used in this experiment, and the label an individual participant saw varied depending on the treatment. We randomly assigned treatments to the participants based on their

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et al. 2004). Posted prices may also help participants formulate a value for an unfamiliar product. For example, List and Shogren (1999) find that while posted prices influence median bids for unfamiliar products, they do not influence median bids for familiar products or when are provided with additional non-price information. However, given that the winning price is determined at random in the BDM auction, the benefits from posted prices are likely to be small and may be outweighed by anchoring (Corrigan and Rousu 2006b).

arrival time at the grocery store, so the estimation of the treatment effect is the difference in means across treatments (Wooldridge, 2002).

In the “simple label” treatment, fair trade product labels indicated that those products were “fair trade certified” with no additional explanation.

In the “short descriptive” label treatment, fair trade products displayed a “fair trade certified” graphic provided by TransFair USA, a California-based non-governmental organization that certified both the bananas and the chocolate used in this study, along with the following short descriptive statement: “Buy fair trade and make a difference in your global community.” At the time the experiment was conducted, a specialty grocery chain was using this language to promote its fair trade offerings.

In the “long descriptive” label treatment, fair trade products displayed the same TransFair USA graphic along with the following longer descriptive statement recommended by TransFair USA: “By choosing this Fair Trade product you are directly supporting a better life for farming families through fair prices, direct trade, community development, and environmental stewardship.” At the time the experiment was conducted, TransFair USA suggested using this language on product labels. Figure 1 presents all four chocolate bar labels.<sup>6</sup>

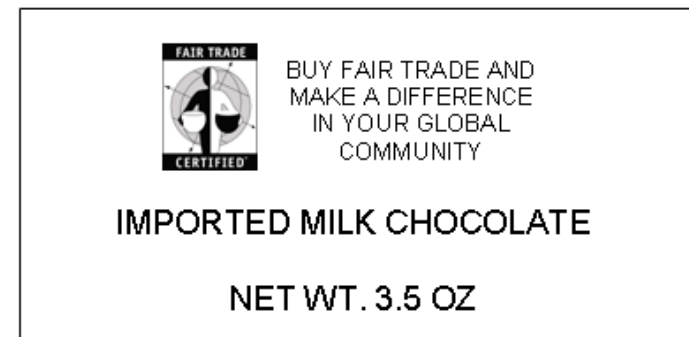
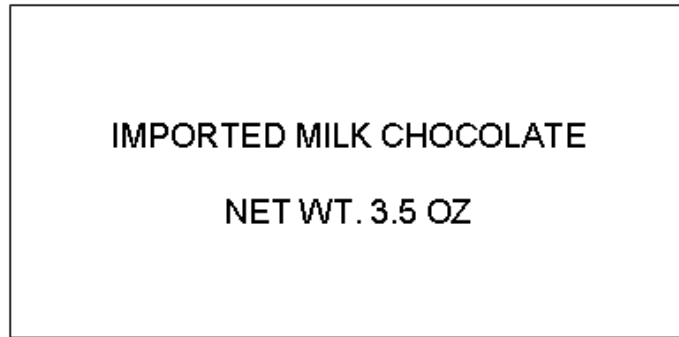
For each product, participants placed a bid for both a fair trade version and a non-fair trade (conventional) version of the product. Depending on the treatment, participants bid on either (1) conventional products and fair trade products with the simple label, (2) conventional products and fair trade products with the short descriptive label, or (3) conventional products and fair trade products with the long descriptive label.

### **3. Model to determine the welfare loss from alternative labels**

We now discuss the methodology used to determine the welfare loss from labels that inadequately inform consumers. We compared bids before and after a

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<sup>6</sup> An interesting extension of this research would be to test whether other alternative labels would be more or less appealing to consumers. For example, some consumers may worry that the additional income farmers receive from selling fair trade commodities does not justify the markup retailers charge for fair trade products. Labels that provide explicit information about the premium farmers receive may best address this concern.



**Figure 1. Chocolate bar labels**

consumer read verifiable information to examine how well the label informed consumers. A participant that is more informed after reading verifiable information should be able to provide bids that more accurately represent her preferences. If a participant's bid for a product before she received verifiable information is the same as (or very similar to) her bid for a product after she received verifiable information, this provides evidence that the label did an effective job describing the attributes of a fair trade product. However, if a participant's bid for a product in the absence of the verifiable information is quite different from her bid after being informed by the government information, this provides evidence that the label was ineffective at describing the attributes of the product. This model allows us to determine the effectiveness of labels on fair trade food products.

Following Rousu et al. (2007) and Rousu and Shogren (2006), we first consider the consumer surplus a participant would receive from buying either the fair trade product or the conventional product.

$$FT\_CS^{j,K} = Bid\_FT^{j,K} - P\_FT^K \quad (1)$$

$$CONV\_CS^{j,K} = Bid\_CONV^{j,K} - P\_CONV^K \quad (2)$$

Equation (1) shows that the consumer surplus participant  $j$  receives from buying the fair trade version of product  $K$  is simply the difference in the participant's bid (her demand) and the price the participant would pay for the product in the market. Similarly, equation (2) shows the consumer surplus consumer  $j$  receives from buying the conventional version of product  $K$ .<sup>7</sup>

For modeling purposes, we assume each participant purchases one and only one version of each product. A participant would then purchase the product that gives her the higher amount of consumer surplus.<sup>8</sup> So prior to receiving verifiable information, participant  $j$  would buy the fair trade version of product  $K$

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<sup>7</sup> We estimate the market prices for both bananas and chocolate using market prices at the time of the experiment. For bananas, the fair trade bananas were \$1.98 for a 2-pound bunch while the conventional bananas were \$1.38 for a 2-pound bunch. The fair trade chocolate was \$2.50 for a 3.5-ounce bar while the conventional chocolate sold for \$2.07.

<sup>8</sup> Several studies (e.g., Harrison, Harstad, and Rutström 2004) find that experimental auction bids may be censored at or near a good's field price (i.e., its price outside of the experiment). Since conventional bananas and chocolate are readily available in the field, we would expect field price censoring to affect bids and consumer surplus estimates for the conventional products. Following Lancaster (1971), we assume that participants' WTP for a product is determined by their WTP for that product's various traits. More specifically, we assume that WTP for the fair trade version of a product is simply equal to (censored) WTP for the conventional product plus WTP for the fair trade designation as applied to that product. Under this assumption, field price censoring affects bids and consumer surplus estimates for both products equally even though the fair trade products were not available in Harrisburg, PA when we conducted this study. Therefore, we can meaningfully infer whether a participant would choose to buy the conventional or fair trade version of a product by comparing consumer surplus estimates for both versions.



when the consumer surplus from purchasing the fair trade version exceeds the consumer surplus from buying the conventional version, as shown in equation (3):

$$BUY\_FT_{pre-info}^{j,K} = 1 \text{ if } FT\_CS^{j,K} \geq CONV\_CS^{j,K}. \quad (3)$$

Similarly, participants would purchase the conventional version of product  $K$  when:

$$BUY\_FT_{pre-info}^{j,K} = 0 \text{ if } FT\_CS^{j,K} < CONV\_CS^{j,K}. \quad (4)$$

After receiving verifiable information, participant  $j$  would purchase the fair trade version of product  $K$  when:

$$BUY\_FT_{post-info}^{j,K} = 1 \text{ if } FT\_CS^{j,K} \geq CONV\_CS^{j,K}. \quad (5)$$

Participant  $j$  would purchase the conventional version of product  $K$  when:

$$BUY\_FT_{post-info}^{j,K} = 0 \text{ if } FT\_CS^{j,K} < CONV\_CS^{j,K}. \quad (6)$$

We assume the verifiable information given to participants is accurate, and ideally the government would like all consumers to know this information when making food purchasing decisions. We will call a participant “informed” after she receives verifiable information. Our analysis will classify a label as causing a “mispurchase” when the participant would purchase a fair trade product when less informed but a conventional product when informed, or vice versa. This is shown in equation (7):

$$label\_mispurchase_{j,k,label} = 1 \text{ if } BUY\_FT_{post-info}^{j,K,label} \neq BUY\_FT_{pre-info}^{j,K,label}. \quad (7)$$

If participant  $j$  purchases the same version of product  $K$  both before and after becoming informed, then that label would be adequate for that participant. However, if a participant purchases a different version after becoming informed (e.g., purchases the fair trade version when she would have purchased the conventional version), then the label is inadequate for informing that participant and has caused a mispurchase. In our experiment there were three labeling treatments, so our experimental design and model will allow us to determine the relative effectiveness of these three labels.

While we now know how to examine whether a participant would make a mispurchase, we want to determine the welfare loss participants would incur by making a mispurchase. To do this, we examine the consumer surplus a participant would forgo because she was purchasing a different product from what she would purchase when informed. We examine the relative consumer surplus a participant receives by purchasing one product instead of the other. When informed, each participant would purchase the product that gives her the higher consumer surplus, so the consumer surplus premium the participant receives is:

$$CS\_PREM^{j,K} = |FT\_CS^{j,K} - CONV\_CS^{j,K}|. \quad (8)$$

All participants gain a nonnegative premium by being able to purchase the product that gives them higher consumer surplus. This premium can be used to determine the welfare loss from an inadequate label.

If a participant makes a mispurchase, she is not obtaining the premium as shown in equation (8). Thus, this premium represents the welfare loss to a participant who would make a mispurchase prior to receiving verifiable information. In other words, the label alone was not adequate in giving the participant the necessary information for her to make an informed choice. The premium represents the welfare loss from a sub-optimal label when a participant makes a mispurchase.

We will measure two different welfare losses from inappropriate labels. The first is the average welfare loss to the participants who are being adversely affected and would switch to purchase the alternative product (i.e., making a mispurchase because they are inadequately informed); the second is the average welfare loss to all individuals. These welfare measures are shown in equations (9) and (10).

$$\text{WellLoss\_switcher} = \frac{\sum_{k \in \text{switched}} CS\_PREM^{j,K}}{N^{\text{switchers}}} . \quad (9)$$

$$\text{WellLoss\_person} = \frac{\sum_{k \in \text{switched}} CS\_PREM^{j,K}}{N^{\text{population}}} . \quad (10)$$

Through our model, we can measure the welfare losses from alternative labels. We also examine whether any of the three labels are inferior or superior to the others. Finally, our experimental design and implementation allow us to conduct conditional tests examining what factors cause a consumer to lose welfare because of an inadequate label.

#### 4. Results

Mean and median bid prices are provided in Table 2. Overall, participants place a premium on the fair trade version of the products between \$0.10 and \$0.24 per product, and this effect is statistically significant.<sup>9</sup>

Table 3 shows the percentage of participants who switch both to and from the fair trade version of each product under each labeling scheme. Three facts emerge. First, for each label, there are some participants who would make mispurchases. Some would initially buy the fair trade product but would buy the conventional product after receiving verifiable information; others would initially

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<sup>9</sup> A study that extended this work by examining the costs to firms of selling fair trade foods could be useful as it would provide an indication whether firms would increase profits by selling fair trade food products.

**Table 2: Mean and median bid prices (N=122)**

	Pre-information		Post-information	
	Mean Bids	Median Bids	Mean Bids	Median Bids
Conventional bananas	\$1.22 (0.84)	\$1.00	\$1.19 (0.85)	\$1.00
Fair trade bananas	\$1.33 (1.03)	\$1.00	\$1.30 (0.95)	\$1.00
Premium for fair trade bananas	\$0.10** (0.44)	\$0.00	\$0.11*** (0.38)	\$0.00
Conventional chocolate	\$1.27 (1.02)	\$1.00	\$1.26 (1.09)	\$1.00
Fair trade chocolate	\$1.37 (1.15)	\$1.00	\$1.50 (1.25)	\$1.13
Premium for fair trade chocolate	\$0.10* (0.60)	\$0.00	\$0.24*** (0.64)	\$0.00

\* Statistically significant at the 10% level using a 2-sided t-test.

\*\* Statistically significant at the 5% level using a 2-sided t-test.

\*\*\* Statistically significant at the 1% level using a 2-sided t-test.

buy the conventional product but would buy the fair trade product after receiving verifiable information. Across treatments, between 11.1% and 15.4% of participants would switch to or from the fair trade bananas, while between 13.9% and 17.9% of participants would switch to or from the fair trade chocolate bar. Because we provide verifiable information – and because the fair trade designation may mean different things to different people<sup>10</sup> – it seems reasonable that some participants place a greater value on fair trade foods after reading the information, while others placed a lower value on fair trade foods after reading it.

Second, the long descriptive label may outperform the simple label in that the long descriptive label leads to a smaller percentage of mispurchases for both bananas and chocolate. However, this difference is not statistically significant. One potential reason for the statistically insignificant results is the small number of switchers. While our overall sample size of 122 is larger than that of many other experimental auctions (e.g. Lusk et al., 2001a; Fox et al., 2002; Corrigan and Rousu, 2006a), only 14 participants made a mispurchase for bananas and only

<sup>10</sup> For example, political commentator Lou Dobbs (2004) refers to “calls by members of Congress for this country to conduct fair trade and balanced trade,” referring to the rights of domestic manufacturing workers, not foreign farm workers.

**Table 3: Number and percentage of consumers that mispurchase**

		Simple label (N=39)	Short- descriptive label (N=47)	Long- descriptive label (N=36)
Bananas	Mispurchases for those initially buying conventional product	2 (5.1%)	2 (4.3%)	2 (5.6%)
	Mispurchases for those initially buying fair trade product	4 (10.3%)	2 (4.3%)	2 (5.6%)
	<b>Total mispurchases</b>	<b>6** (15.4%)</b>	<b>4** (8.5%)</b>	<b>4** (11.1%)</b>
Chocolate	Mispurchases for those initially buying conventional product	5 (12.8%)	5 (10.6%)	3 (8.3%)
	Mispurchases for those initially buying fair trade product	2 (5.1%)	5 (10.6%)	2 (5.6%)
	<b>Total mispurchases</b>	<b>7*** (17.9%)</b>	<b>10*** (21.3%)</b>	<b>5** (13.9%)</b>

\* Statistically significant at the 10% level using a 2-sided t-test.

\*\* Statistically significant at the 5% level using a 2-sided t-test.

\*\*\* Statistically significant at the 1% level using a 2-sided t-test.

22 for chocolate. Researchers using this methodology in future studies may wish to consider a larger sample.<sup>11</sup>

Third, objective information about fair trade leads to a significant number of switches for both goods and for all three label treatments. As a service to customers, retailers may wish to provide this kind of information to consumers. However, because our results indicate objective information causes the same number of participants to switch from fair trade products as it causes to switch to fair trade products, we do not find evidence that a large-scale consumer education campaign would increase sales of fair trade foods.

While Table 3 examines the percentage of participants who switch, examining what factors cause a consumer to initially make a mispurchase and switch after receiving information is also worth exploring. Table 4 presents the results of a random-effects logit analysis controlling for the label treatment, demographic characteristics, and the bid submitted in round one.<sup>12</sup> We find no evidence that there is a difference across labels, since the coefficients for the dummy variables on the labeling types are not statistically significant. We do find, however, that participants age 40 years or older were less likely to make a mispurchase, indicating that older participants were more likely to correctly interpret the label and make the correct purchase based on their tastes. We also find that participants who initially bid higher on the products are less likely to switch to either the fair trade product or away from the fair trade product. This provides evidence that those who initially indicated a higher value for bananas or chocolate were less likely to be influenced by information.

Table 5 presents the welfare loss from inadequate labels. The average welfare loss from banana labels ranges from \$0.037 to \$0.077 per bunch. Similarly, the average welfare loss from a chocolate labels ranges from \$0.101 to \$0.134 per bar. These differences are statistically significant at the 10% level using a Wilcoxon signed-rank test.<sup>13</sup> For both products, the smallest welfare loss appears for the short-descriptive label, but statistical tests do not indicate any statistically significant differences across labels.

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<sup>11</sup> We thank an anonymous reviewer for this insight.

<sup>12</sup> An anonymous reviewer mentioned how it would have been useful to ask how much information participants knew/understood about fair trade labels prior to the experiment, as prior knowledge has been shown to influence food purchasing decisions (e.g. see Huffman et al. 2007). Unfortunately, given time constraints of a field experiment our questionnaire was quite limited and this question was not asked. Future experimental research looking into preferences for fair trade foods may wish to assess the effects of prior knowledge.

<sup>13</sup> T-tests yield similar results, which are available from the authors upon request.

**Table 4: Random-effects logit results (N=244)<sup>a</sup>**

Variable	Specification	
	(1)	(2)
Intercept	3.31*** (4.93) <sup>b</sup>	3.77*** (4.25)
Label – simple	-0.30 (-0.60)	-0.31 (-0.60)
Label – long-descriptive	-0.81 (-1.41)	-0.92 (-1.55)
Race – white	-0.03 (-0.07)	-0.05 (-0.1)
Female	0.38 (0.82)	0.34 (0.72)
Has at least a bachelor's degree	0.70 (1.41)	0.69 (1.38)
Is 40 years old or older	-0.93** (-2.01)	0.95** (-2.03)
Initial bid for conventional product	-0.86*** (-4.34)	----
Initial bid for fair trade product	----	-0.78*** (-4.43)
Member of an environmental organization	0.19 (0.30)	0.04 (0.06)

<sup>a</sup> Dependant variable equals 1 if a participant initially made a mispurchase but switched after receiving verifiable information.

<sup>b</sup> t-statistic in parentheses

\* Statistically significant at the 10% level using a 2-sided t-test.

\*\* Statistically significant at the 5% level using a 2-sided t-test.

\*\*\* Statistically significant at the 1% level using a 2-sided t-test.

## 5. Conclusions

Governments and nonprofit agencies spend millions of dollars annually in an attempt to adequately label food products. This is complicated because while food labels would ideally allow consumers to behave as if they were fully informed, space constraints on labels and time constraints on consumers mean that labels cannot in reality convey all relevant information. However, little work has been done to develop methods that can determine the welfare loss when an

**Table 5: Welfare loss from Alternative labels**

	Generic label (N=39)		Short-descriptive label (N=47)		Long-descriptive label (N=36)	
	Mean per subject	Median per switcher	Mean per subject	Median per switcher	Mean per subject	Median per switcher
Welfare loss for those who mispurchase when initially purchasing conventional bananas	\$0.02	\$0.41 [2] <sup>a</sup>	\$0.01	\$0.28 [2]	\$0.02	\$0.40 [2]
Welfare loss for those who mispurchase when initially purchasing fair trade bananas	\$0.06*	\$0.55* [4]	\$0.03	\$0.61 [2]	\$0.03	\$0.45 [2]
Average welfare loss from inadequate banana labels	\$0.08**		\$0.04*		\$0.05*	
Welfare loss for those who mispurchase when initially purchasing conventional chocolate	\$0.09**	\$0.67** [5]	\$0.03**	\$0.32 [5]	\$0.06	\$0.72 [3]
Welfare loss for those who mispurchase when initially purchasing FT chocolate	\$0.05	\$0.94 [2]	\$0.05**	\$0.45 [5]	\$0.05	\$0.94 [2]
Average welfare loss from inadequate chocolate labels	\$0.13** *		\$0.10** *		\$0.11**	

<sup>a</sup> Number who mispurchase in brackets.

\* Statistically significant at the 10% level in a one-sided Wilcoxon signed-rank test.

\*\* Statistically significant at the 5% level in a one-sided Wilcoxon signed-rank test.

\*\*\* Statistically significant at the 1% level in a one-sided Wilcoxon signed-rank test.

inferior label is implemented, and there has also been minimal research showing a method to compare several alternative labels for effectiveness.

We fill this gap in the literature by creating an experimental design and applied model that allows for the estimation of the welfare loss from alternative labels, and allows researchers to determine which label from a candidate set best informs consumers. This type of research is important, as several government and nonprofit agencies are beginning to use experimental auctions to attempt to answer these types of questions.



Using three candidate labels to indicate that a food product is fair trade certified, we estimate the number of people who make a mispurchase and the welfare loss from each of the three labels. We find that between 11.1% and 17.9% of participants would make a mispurchase, depending on the product and label, but find no evidence that one label performs significantly better than others among our candidate set of labels. The welfare loss to consumers from being inadequately informed ranged from \$0.037 to \$0.134 per product.

## **Appendix A: Experimental Instructions**

Welcome and thank you for agreeing to participate in this research on decision making.

Because we are interested in the value that you personally place on various products, we ask that you please refrain from communicating with other participants during this research.

Please be assured that all information collected here will only be used for group comparisons. No personal information will be divulged for any reason, and we will never be able to attach your name to any of your responses.

## How this Auction Works

Today we are going to hold a ***limit price auction***. In this auction you'll be asked to write down your bids on a sheet of paper. All bids will be kept private.

The auction has five steps:

- Step 1: You examine all the products potentially for sale.
- Step 2: You write down separate bids for each product (for example, four products means four separate bids).
- Step 3: The monitor draws a number at random to determine the ***binding product***. Only the binding product will actually be sold. This is done to make sure that no one ends up buying more than one product.
- Step 4: The monitor randomly selects a ***limit price*** between \$0.10 and \$6.00 (in 10-cent increments).
- Step 5: We compare your bid for the binding product with the limit price to determine whether you purchase the product.
  - If your bid is equal to or higher than the limit price, you buy the product ***and pay the limit price***.
  - If your bid is less than the limit price, you do not purchase the product.

***Please note that in this auction it is always in your best interest to bid your true value for a product.*** This is because if you win the auction you do not pay what you bid, you pay the randomly chosen limit price. If you bid less than your true value, you might end up missing out on a profitable opportunity. If you bid more than your true value, you might end up paying more than you wanted to for the product. Also, keep in mind that you are not bidding against anyone else in this auction—whether you purchase the product depends only on your bid and the randomly selected limit price.

## Practice Auction

As a warm-up exercise you will place separate bids on two products: a box of pencils and a box of pens.

This auction is only for practice. It is simply intended to familiarize you with the steps we will be using in the real auction that follows.

- Step 1: You examine the two products.
- Step 2: You write down separate bids for each product.
- Step 3: The monitor draws a number at random to determine the binding product.
- Step 4: The monitor randomly selects a limit price between \$0.10 and \$6.00.
- Step 5: We compare your bid for the binding product with the limit price to determine whether you would purchase the product were this a real auction.

Again, in this type of auction it is always in your best interest to bid your true value for each product.

## Real Auction

In this auction you will place separate bids on several food products.

This is a real auction. Any winners will be expected to pay for the product they buy.

- Step 1: You examine the food products.
- Step 2: You write down separate bids for each product.
- Step 3: The monitor draws a number at random to determine the binding product.
- Step 4: The monitor randomly selects a limit price between \$0.10 and \$6.00.
- Step 5: We compare your bid for the binding product with the limit price to determine whether you purchase the product.

Again, in this type of auction it is always in your best interest to bid your true value for each product.

Thanks again for participating in this research project. At this point the monitor will determine the binding product and any transactions agreed to will be carried out.

Before leaving, we also ask that you complete a short survey. Your responses will only be used for group comparisons, and we will never be able to connect your name to any of your responses.

Please answer the following questions by checking the appropriate box or by filling in the appropriate line. Remember that we will never be able to connect your name to any of your responses.

1) How often do you or your family members eat bananas?

- ☐ Every day
- ☐ More than once a week
- ☐ About once a week
- ☐ About once a month
- ☐ Almost never

2) How many pounds of bananas do you *currently* have at home?

- ☐ None
- ☐ 1 pound (2 or 3 bananas)
- ☐ 2 pounds (5 or 6 bananas)
- ☐ 3-4 pounds
- ☐ 5-7 pounds
- ☐ 8 or more pounds

3) How many pounds of bananas do you *normally* have at home?

- ☐ None
- ☐ 1 pound (2 or 3 bananas)
- ☐ 2 pounds (5 or 6 bananas)
- ☐ 3-4 pounds
- ☐ 5-7 pounds
- ☐ 8 or more pounds

4) Were you planning to buy bananas today?

- ☐ Yes
- ☐ No

5) How often do you or your family members eat chocolate?

- ☐ Every day
- ☐ More than once a week
- ☐ About once a week
- ☐ About once a month
- ☐ Almost never

6) How many chocolate bars do you *currently* have at home?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3-4
- ☐ 5-7
- ☐ 8 or more

7) How many chocolate bars do you *normally* have at home?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3-4
- ☐ 5-7
- ☐ 8 or more

8) Were you planning to buy chocolate today?

- ☐ Yes
- ☐ No

- 9) How much do you think a bunch of bananas similar to the ones you bid on today would cost at this store?

\$ \_\_\_\_\_

- 10) How much do you think a candy bar similar to the ones you bid on today would cost at this store?

\$ \_\_\_\_\_

- 11) How often do you buy organic or fair trade products?

- ☐ Whenever possible  
☐ Sometimes  
☐ Almost never

- 12) Are you a member of an environmental organization?

- ☐ Yes  
☐ No

- 13) Where would you place yourself on a scale of 1 to 10 if a 1 means saving jobs at all costs, and a 10 means saving the environment at all costs? (CIRCLE JUST ONE)

1      2      3      4      5      6      7      8      9      10

- 14) Where would you place yourself on a scale of 1 to 10 if a 1 means that you only care about you and your family's wellbeing, and a 10 means that you only care about the wellbeing of future generations and people living in other countries? (CIRCLE JUST ONE)

1      2      3      4      5      6      7      8      9      10

- 15) What is your gender?

- ☐ Male  
☐ Female

- 16) What is your age? \_\_\_\_\_

- 17) What is your race?

- ☐ White, non-Hispanic  
☐ Black  
☐ Hispanic  
☐ Other

- 18) What is your highest level of education?

- ☐ Some high school  
☐ High school diploma  
☐ Some college  
☐ 4-year college degree  
☐ Some graduate school  
☐ Graduate degree

- 19) Are you currently attending college?

- ☐ Yes  
☐ No

- 20) What is your approximate annual household income (before taxes)?

- |   |  |
|---|--|
| <input type="checkbox"/> Less than \$14,999 | <input type="checkbox"/> \$50,000-\$74,999   |
| <input type="checkbox"/> \$15,000-\$24,999  | <input type="checkbox"/> \$75,000-\$99,999   |
| <input type="checkbox"/> \$25,000-\$34,999  | <input type="checkbox"/> \$100,000-\$149,999 |
| <input type="checkbox"/> \$35,000-\$49,999  | <input type="checkbox"/> \$150,000 or more.  |



## **Appendix B: Information on Fair Trade Given to Participants**

The following statement on fair trade has been approved by a group of academic, religious, and community leaders who have no financial stake in fair trade foods:

The fair trade movement promotes international labor, environmental, and social standards. The movement focuses on exports from poorer countries such as Ecuador and Ghana to richer countries such as the United States. Standards may be voluntarily adhered to by importing firms, or enforced by governments. Proposed and practiced fair trade policies vary widely, but most often take the form of minimum price support schemes for products such as bananas, cocoa, and coffee. Non-government organizations also play a role in promoting fair trade standards by serving as independent monitors of compliance with fair trade labeling requirements.

*Source: Wikipedia*

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